REMARKS/ARGUMENTS

Claims 1-6 and 15-20 in the case are pending. Claims 1-3 and 15-17 have been rejected under 35 U.S.C. §102(b) as being anticipated by JP 07-138403 to Sekisui Plastics. Claims 4-6 and 18-20 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Sekisui in combination with Applicant's statement of the prior art or U.S. Patent No. 5,618,853 to Vonken. Claim 15 has also been rejected under 35 U.S.C. §112, second paragraph.

In view the art rejections, Applicant has amended base Claims 1 and 15 herein to recite *polytetraflouroethylene particles having an average diameter of less than 4 microns.*

The prior art cited (Sekisui) describes a foam composition including PTF with a mean particle diameter of between 5-40 micrometers. As stated above, Applicant's present claimed composition includes polytetraflouroethylene (PTF) particles having an average diameter of less than 4 microns. This particle size distinction is important and non-obvious in view of the art cited, as discussed below.

Physical nucleators used in foam typically have a relatively large particle size. Conventional theory suggests that the nucleation phenomenon in foaming is due to the surface energy of the particle. Such energy may vary with material type, but in general, there is an inefficiency in the use of such particles such that less cells are created than particles are added. Such efficiency can be calculated and for example might be in the range of 50% to 70% for a particle such as talc. Although floropolymers have a higher surface energy than talc (which is widely used in the industry), the efficiency gain versus cost would not be significant and would likely be dismissed. Due to high cost of such materials, usage would not gain momentum and as such, usage of floropolymer particles of typical nucleant size is virtually unknown in the foam industry. Once exception is nucleation of polyester foam, wherein the high surface energy of the particle serves to nucleate at the high extrusion temperature of polyester foams where typical particle nucleators perform poorly.

Small particles of less than about 2 micron, although having greater number of particles by the cube of the inverse ratio of the diameters when compared to conventional nucleant sizes have been found to nucleate poorly or not at all. Conventional theory holds that such small particles do not possess enough surface energy to initiate a cell. Therefore such particles have not been used. In experimentation, the present Applicant discovered that these small particles, when composed of floropolymers, did indeed possess the needed surface energy to initiate nucleation and can therefore be used to make quality foam produces at a cubic factor less in mass than the larger counterpart. Initially, this solved a need for improved economics, but is not the basis for this invention.

It is known by those skilled in the art that the nucleant particles are relatively large when compared to the wall thickness of the cell structure contained in low density foam. These materials also tend to have high heat capacities and act as a hot spot during cell formation. As such, they serve their purpose of introducing cell sites, but build imperfections into the structure that compromise physical properties as they slowly cool when compared to the surrounding polymer matrix. This has been the state of physical nucleators for a very long time.

In the use of small particle floropolymer nucleators (less than 4 microns), significant improvements in physical properties where noted when compared to typical foam products. Examples of improvements found include:

(a) Sidewall strength in the machine direction of manufacture improved up to 8% when compared to the control, but cross direction increases of 40% to 66% above the control were observed (as measured by Instron, table). This supports the assertion that improved structure is realized by using small particle floropolymers nucleators.

(b) Impact Strength for parts aged for a period that would be "typical" from time to manufacture to time of use improved up to 61% when compared to the control. This improvement cited is per the test method contained within the application.

(c) Improvements in density, gauge, and expansion were also observed, again as noted within the body of the application.

Such improvements as those observed above were not noted in the Japanese reference (Sekisui).

Applicant theorizes that the small size of the particles does not introduce a "heat sink" into the polymer matrix. This allows the cells to cool more uniformly within and reduces induced imperfections. The result is improved performance as noted above. This result was unexpected and beneficial as such serves as the basis for the invention disclosed and now claimed.

For all these reasons discussed above, Applicant respectfully submits that the present low density polystyrene foam composition is both novel and patentable over the prior art of record. All claims are now believed to be in condition for allowance. Such action is therefore respectfully requested at an early date. If the Examiner believes that issues remain for discussion, he is invited to contact the undersigned at the telephone number indicated below.

Respectfully submitted,

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